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TRANSFER APPARATUS

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(57)
Material transfer apparatus (10) particularly suited for use with refuse vehicles including a chamber 11 having a segment shaped transfer paddle (14) pivotally mounted for movement in the chamber and having pushing faces (15 and 16). Hydraulic rams (22 and 23) are connected to the paddle (14) through a crank (19) and when actuated cause the paddle (14) to oscillate in the chamber (11) and push materials with the pushing faces (15 and 16) from the chamber (11). A refuse vehicle is also disclosed.

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The following statement is a full description of this invention, including the best method of performing it know to me:-

This invention relates to material transfer apparatus and in a particular aspect to apparatus for use with refuse vehicles for moving or transferring refuse materials into the collecting bin of a refuse vehicle.

A number of different designs of refuse vehicle are used for the collection of refuse deposited into household refuse containers. One type of vehicle employs a side loading mechanism which in use engages a refuse container on a side of the vehicle and elevates and tips the container into a hopper or chamber for transfer of materials into a collection bin usually at the rear of the vehicle. It is known to employ within the hopper, an oscillating paddle which is driven through one hundred and eighty degrees so as to cause in opposite strokes movement of the materials deposited into the hopper rearwardly into the bin. Such known paddles, however, are not particularly efficient because of the extent of movement which they undergo in operation.

For recycling purposes, some refuse vehicles are now provided with a bin which is longitudinally split into two portions, such that materials deposited into the hopper can be directed to opposite bin portions, one bin portion collection one type of material and the other bin portion another type of material. The bin is either divided into its two portions by a vertical divider or horizontal divider. Both types of split bin however present problems in transfer of material deposited into the hopper into the respective bin portions. Often two separate packing mechanisms and/or distribution mechanisms which in some cases incorporate conveyors, are required to move the material into the two bin portions.

The present invention aims to provide an improved material transfer apparatus particularly but not exclusively applicable to use with refuse vehicles for distributing or transferring materials into a collection bin on the vehicle. The present invention also aims to provide material transfer apparatus which may be used with refuse vehicles of the type having a split bin for the

collection of different materials in different parts of the bin for the purposes of recycling. The present invention also aims in a further aspect to provide an improved collection bin having two bin portions for use on refuse vehicles to which different materials may be transferred in a reliable and efficient manner. Other objects and advantages of the invention will become apparent from the following description.

The present invention thus provides in one preferred aspect, material transfer apparatus for transferring materials from a first location to a second location, said apparatus including chamber means for receiving materials to be transferred, and transfer means within said chamber means, said transfer means having a pair of spaced apart pushing faces, and means for moving said transfer means between first and second positions, said transfer means in said first position having one said pushing face arranged substantially centrally in said chamber means whilst blocking one half of said chamber means and having in said second position, the other said pushing face arranged substantially centrally in said chamber means whilst blocking the other half of said chamber means.

Preferably the transfer means comprises a segment shaped body mounted for limited rotational movement and the respective faces extend generally radially, or parallel to radii extending from the axis of rotation and define the boundaries of the segment shaped body. Preferably the segment shaped body is in the form of a quadrant such that the pushing faces are disposed substantially at ninety degrees to each other. A top wall or barrier suitably extends between the faces, the top wall or barrier serving to block half of the chamber means rearwardly of the operative pushing face. The chamber means is preferably of half circular form in plan view, however, the chamber may be of other segment shaped form. For example, the chamber may extend through angles down to ninety degrees or less up to angles greater than one hundred and eighty degrees. The

transfer means is suitably shaped, such that when the respective pushing faces are arranged substantially centrally, that is at a position substantially half way between the ends of the chamber, one half of the chamber is blocked. The transfer means should therefore extend through an arc at least half of the arc of the chamber. The transfer means is suitably rotatably movable between the first and second positions under the influence of fluid actuated rams.

In one application, a central guide is provided above the transfer means such that different types of materials may be directed to opposite sides of the chamber means. For example, materials to be recycled may be directed to one side of the chamber means and other non-recyclable materials may be directed to the other side of the chamber means. Operation of the transfer means will thus move the materials in opposite sides of the chamber means to different locations. Suitably the different locations comprise separate compartments whereby the respective materials may be separately collected. Preferably, the separate compartments are defined in one collection bin of a refuse vehicle, the compartments being suitably defined by a longitudinally extending barrier in the collection bin. The barrier may comprise a vertical barrier to divide the collection bin into a pair of side by side compartments or alternatively the barrier may be horizontal so that the compartments are disposed one above the other.

The guide for separating the materials in their passage to the chamber means may be removable to enable the transfer apparatus to transfer a mixture of materials or only one type of material to the second location.

In a further aspect, the present invention comprises a refuse vehicle having a refuse collection bin and characterised in that longitudinally extending barrier means are provided in said bin to separate said bin into first and second collection compartments, said barrier means being inclined to the horizontal. A refuse vehicle

of this type may be used with the above described transfer apparatus which may be disposed at a similar but opposite inclination to the inclination of the barrier means such as to direct materials in use to opposite sides thereof.

The transfer apparatus of the invention may be disposed in any orientation ranging from a horizontal orientation for use with refuse collection vehicles having a conventional collection bin or bin separated by a vertical divider to a vertical orientation to direct materials to a bin having a horizontal or no divider.

The hydraulic rams for the transfer means may be arranged such that less pressure is provided to the transfer means when recyclable materials are being transferred so that these materials are packed more loosely and not excessively compressed.

The present invention in yet a further aspect provides an actuating mechanism for a rotatable transfer paddle including a pair of rams selectively actuable for oscillating the paddle in opposite directions, the rams being controllable, such that both may be actuated for at least part of the oscillating stroke of the paddle.

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention and wherein:-

Fig. 1 is a schematic plan view of the transfer apparatus according to the present invention;

Fig. 2 illustrates the preferred form of the transfer paddle for use in the transfer apparatus of Fig. 1;

Figs. 3 to 6 illustrates schematically the operation of the apparatus of the invention;

Fig. 7 illustrates schematically the transfer apparatus in end view associated with a bin or refuse vehicle;

Fig. 8 is a schematic side view of the apparatus and bin of Fig. 7; and

Fig. 9 illustrates schematically a refuse vehicle

bin provided with an inclined divider and associated inclined transfer means; and

Fig. 10 illustrates an alternative orientation of the transfer means.

Referring to the drawings and firstly to Fig. 1, there is illustrated material transfer apparatus 10 according to the present invention, including an open topped chamber 11 of part circular form in plan view, the chamber 11 being adapted to receive materials to be transferred. A pair of transfer openings 12 and 13 as more clearly shown in Fig. 7 are provided on each side of the chamber 11 through which material may be moved or packed by the apparatus 10. Supported for movement within the chamber 11 is a transfer paddle 14 which in the embodiment illustrated is a body of substantially quadrant shaped form in plan view and which has a pair of radially extending side pushing faces 15 and 16 disposed substantially at right angles to each other, such that the paddle 12 extends approximately through ninety degrees (see also Fig. 4). The paddle 14 also includes a quadrant shaped top wall 17 which extends between and joins the pushing faces 15 and 16. The paddle 14 is mounted rotatably on a shaft 18 at a position adjacent the intersection of the faces 15 and 16 at the centre of the circle defining the part circular chamber 11. An actuating crank 19 is fixed for movement with the paddle 14 and has a pair of crank arms 20 and 21 which extend substantially at right angles to each other and generally parallel to the respective faces 15 and 16. The paddle 14 is adapted to be actuated by a pair of opposite hydraulic rams 22 and 23 which are connected to the outer ends of the respective crank arms 20 and 21 at one end and which are mounted at their other ends 24 and 25 in fixed positions for rotation.

As shown in Fig. 3, hydraulic valves 26 and 27 are connected to each ram 22 and 23 to control the application of hydraulic fluid thereto as described further below. A scraper blade 28 is located with a small clearance above the paddle 14, the scraper blade 28 being

located at a central position relative to opposite sides of the chamber 11 and extending radially of the chamber 11.

In use and as shown in Fig. 3 to 6 and assuming that the paddle 14 is initially in the position of Figs. 1 and 2, the paddle top wall 17 blocks half of the chamber 11, such that any material deposited into the chamber 11 will either collect within the open half 29 of the chamber 11 or on the paddle wall 17. In the position of Fig. 2, the valve 27 is actuated to apply fluid to the piston rod end of the ram 23 and connect the opposite end of the ram 23 to tank. At the same time, the valve 26 connects the opposite ends of the other ram 22 to tank. Application of hydraulic fluid to the piston rod end of the ram 23 will cause retraction thereof and through the crank arm 21, clockwise movement of the paddle 14 such that the face 15 will push against materials deposited into the chamber 11 and force those materials out of the chamber 11 through the opening 12.

In the position of Fig. 4, the ram 23 approaches maximum retraction and at this position, the valve 27 ceases supply to the ram 23 and connects the ram 23 to tank. At the same time, the valve 26 is actuated to apply fluid to the piston end of the other ram 22 and connect the opposite end to tank. This will cause extension of the ram 22 and maintain the paddle 14 moving in a clockwise direction. In the position of Fig. 5, the paddle 14 has completed ninety degrees movement. At this position, maximum resistance to movement of the paddle 14 is encountered. The crank arm 20 is arranged such that maximum torque is applied by the ram 22 to the paddle 12 at this position. The left side of the chamber 11 is now fully closed off by the wall 17, whilst the opposite side is open at 30 to receive further materials for transfer. During movement of the paddle 14 from its Fig. 3 to Fig. 5 position any materials on the top wall 17 of the paddle 14 are swept from the top wall 17 of the paddle 14 into the opening portion 30 of the chamber.

The valve 27 maintains the ram 23 connected to

tank, whilst the valve 26 is actuated to connect the piston rod end of the ram 22 to fluid pressure and the opposite end to tank. The paddle 14 then reverses its direction of movement and in this instance the face 16 becomes the operative pushing face to force materials through the opening 13. The paddle 14 undergoes a similar motion to that previously described. The paddle 14 thus undergoes ninety degrees movement in opposite directions to force materials deposited into the chamber 11 alternatively through the respective openings 12 and 13 for collection.

In the above described embodiment the rams 22 and 23 operate independently to oscillate the paddle 14. The rams 22 and 23 may, however, be controlled by the valves 26 and 27 such that both can act to cause oscillation of the paddle 14. Thus assuming that the paddle 14 is moving from the position of Fig. 3 to Fig. 4 with application of fluid to the ram 23 only and then subsequently to the ram 22, fluid may again be applied to the ram 23 to cause extension thereof when it moves to a beyond centre position relative to its pivotal connection to the crank arm 21. That is, when the pivotal connection between the ram 23 and arm 21 moves beyond a line joining the centre of the pivot shaft 18 and connection 25 (shown in dotted outline in Fig. 4) hydraulic fluid is supplied to the piston end of the ram 23 to assist in moving the paddle 18 in a clockwise direction and towards the end of its travel shown in Fig. 5. This arrangement permits increased force to be applied at the end of the stroke of the paddle 14 for pushing materials through the opening 12. This is achieved with little extra fluid flow and permits a reduction in pressure requirements due to the fact that both rams 22 and 23 are operating. A similar arrangement can be provided on the reverse stroke.

In a slightly modified arrangement, rather than stopping supply to the ram 23 in the Fig. 4 position, fluid supply may be maintained until again an over centre position is reached at which point the fluid supply is reversed to cause extension of the ram 23. A similar arrangement may be provided for the ram 22 on the opposite

stroke. Control of the valves 26 and 27, for supplying the respective rams 22 and 23 may be by means of cams provided on the shaft 18.

The transfer apparatus 10 described above is suitable for use with conventional refuse vehicles having a collection bin rearwardly of, in front of, or adjacent to the transfer assembly 10, the paddle 14 pushing materials deposited into the chamber 11 through the respective openings 13 and 14 into the collection bin 31.

The transfer apparatus 10 is also particularly suitable for use with refuse vehicles 31 of the type shown in Figs. 7 and 8. In such a vehicle 31, the chamber 11 is normally arranged at the forward end of a collection bin 32. The rams 22 and 23 and associated crank 19 is disposed below the transfer apparatus and the base 33 of the chamber 11 is raised so as to more efficiently transfer materials into the collection bin 32. A chute 34 is provided for directing materials towards the chamber 11. A side loader mechanism (not shown) is provided for elevating and tipping a refuse container 35 into the chute 34 for directing materials into the chamber 11. The bin 32 in this vehicle is provided with a vertical longitudinally extending divider 36 which separates the bin 31 into two side by side compartments each of which is aligned with a respective opening 13 and 14 to receive materials therefrom upon oscillation of the paddle 14.

A guide 37 is provided above the paddle 14 extending upwardly from the scraper 28 to direct materials to opposite sides of the chamber 11. In this embodiment the guide 37 is inclined as shown and the refuse bin 35 provided with a divider 38 dividing the bin 35 into two parts 39 and 40 may be elevated and tipped so that the divider 38 is aligned with the guide 37 whereby materials in one bin part 39 are guided by the guide 37 one side of the chamber 11 and materials in the other bin part 40 are guided to the other side of the chamber 11. Oscillation of the paddle 14 will thus cause materials of one type to be packed into one compartment of the collection bin 32 and

materials of another type packed into the other compartment of the collection bin 32.

In the embodiment illustrated in Figs. 7 and 8 the paddle 14 operates in a substantially horizontal plane. The transfer apparatus 10, as shown in Figs. 9 and 10 may also be arranged at an inclination to the horizontal or in a vertical attitude.

The configuration of transfer apparatus 10 of Fig. 9 is most suitably used with a collection bin 41 having a dividing wall 42 which extends generally diagonally and longitudinally of the bin 41 to divide the bin 41 into upper and lower parts 43 and 44. The dividing wall 40 in this embodiment is of an arcuate form in cross-section as shown. The transfer apparatus 10 is inclined at an attitude the same as but opposite to the inclination of the divider 42. In this embodiment, operation of the paddle 14 will cause materials to be transferred into the compartments 43 and 44 alternatively. This configuration is also particularly suitable for recycling applications where a split refuse container 35 may be arranged to deposit different materials to different sides of the chamber 11. For this purpose a guide 45 extends upwardly from a central region of the chamber 11 such that a refuse container 35 may be upended and aligned therewith to enable different materials to be directed to opposite sides of the chamber 11. Further guides 45 and 46 may be provided to assist in directing the materials to opposite sides of the chamber 11. The transfer apparatus 10 may be varied in position from that illustrated to suit requirements.

In the configuration of Fig. 10 the transfer apparatus 10 is disposed in a vertical attitude with the paddle 14 being rotatably movable about a horizontal axis. The apparatus 10 in this configuration, may be used with single compartment collection bins or with bins 47 having a horizontal divider 48 for collection of different types of materials in the manner described previously. Again a guide (not shown) may be provided to direct materials from a split refuse container to opposite sides of the chamber

11 for transfer of materials into the bin 47 above and below the divider 48.

In the arrangements described above the refuse containers 35, where used for recycling purposes have dividers which extend across the bin from one side to the other. The apparatus 10 may however, be used with refuse containers which have dividers extending from front to rear. Suitable guiding chutes are then provided to guide the different materials to respective chamber halves.

If desired, means may be provided to vary the supply of fluid pressure to the respective rams 22 and 23 depending upon the materials being handled. For example, if the transfer apparatus 10 is transferring recyclable materials on one side a reduced pressure may be provided to the rams whilst on the other side for transfer of normal garbage an increased pressure may be provided to the rams 22 and 23. For this purpose, pressure supplied to the pressure line which supplies the valves 26 and 27 may be controlled using a mains supply valve which when the paddle 14 is moving in one direction supplies fluid at a first pressure whilst for movement in the opposite direction a reduced fluid pressure is supplied, achieved for example by use of a pressure reduction valve.

The chamber 11, for receiving the materials to be transferred, suitably has a part cylindrical outer wall with sufficient clearance being provided between the paddle 14 and wall to prevent jamming of materials. Additionally, clearance is provided between the underside of the paddle 14 and base of the chamber 11 for a similar purpose.

The actuating mechanism for the paddle 14 described above may be used with other forms of paddles such as a blade-like paddle moving in a part circular chamber of segment shaped form. When applied to such a configuration, the crank geometry may be altered to achieve the same effect as achieved in the above described embodiment, namely a situation where both rams can be controlled such that at least towards the end of the stroke in opposite directions both rams are acting on the paddle.

Alternatively, the rams may be operated to function independently to cause oscillation of the paddle 14 in opposite directions as described in the first embodiment.

Whilst the above has been given by way of illustrative embodiment of the invention, all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as herein defined in the appended claims.

CLAIMS

1. Material transfer apparatus for transferring materials from a first location to a second location, said apparatus including chamber means for receiving materials to be transferred, and transfer means within said chamber means, said transfer means having a pair of spaced apart pushing faces, and means for moving said transfer means between first and second positions, said transfer means in said first position having one said pushing face arranged substantially centrally in said chamber means whilst blocking one half of said chamber means and having in said second position, the other said pushing face arranged substantially centrally in said chamber means whilst blocking the other half of said chamber means.

2. Material transfer apparatus according to Claim 1 wherein said transfer means comprises a segment shaped body mounted for limited rotational movement.

3. Material transfer apparatus according to Claim 2 wherein the respective faces of said transfer means extend generally radially, or parallel to radii extending from the axis of rotation of said transfer means and define the boundaries of said segment shaped body.

4. Material transfer apparatus according to Claim 3 wherein said segment shaped body is in the form of a quadrant such that the pushing faces are disposed substantially at ninety degrees to each other.

5. Material transfer apparatus according to any one of the preceding claims wherein a top wall or barrier extends between said faces, the top wall or barrier serving to block half of said chamber means rearwardly of the operative pushing face.

6. Material transfer apparatus according to any one of the preceding claims wherein said chamber means is of

half circular form in plan view.

7. Material transfer apparatus according to any one of the preceding claims wherein said transfer means is shaped, such that when the respective pushing faces are arranged substantially centrally, one half of the chamber is blocked.

8. Material transfer apparatus according to any one of the preceding claims wherein said transfer means is rotatably movable between said first and second positions under the influence of fluid actuated rams.

9. Material transfer apparatus according to any one of the preceding claims wherein a central guide is provided above said transfer means such that different materials may be directed to opposite sides of said chamber means.

10. Material transfer apparatus according to Claim 9 wherein said opposite sides of said chamber means communicate with separate collection compartments.

11. Material transfer apparatus according to Claim 10 wherein said separate compartments are defined in a collection bin of a refuse vehicle.

12. Material transfer apparatus according to Claim 11 wherein said compartments are defined by a longitudinally extending barrier in the collection bin.

13. Material transfer apparatus according to Claim 8 wherein said fluid rams exert less pressure on said transfer means when selected materials are being transferred so as to avoid excessive compression of such materials.

14. A refuse vehicle having a refuse collection bin and characterised in that longitudinally extending barrier

means are provided in said bin to separate said bin into first and second collection compartments, said barrier means being inclined to the horizontal.

15. A refuse vehicle according to Claim 14 and including material transfer apparatus according to any one of Claims 1 to 13, said apparatus being inclined opposite to the inclination of said barrier means.

16. An actuating mechanism for a rotatable transfer paddle including a pair of rams selectively actuable for oscillating the paddle in opposite directions, the rams being controllable, such that both may be actuated for at least part of the oscillating stroke of the paddle.

17. Material transfer apparatus substantially as hereinbefore described with reference to the accompanying drawings.

18. A refuse vehicle substantially as hereinbefore described with reference to the accompanying drawings.

19. An actuating mechanism for a rotatable transfer paddle substantially as hereinbefore described with reference to the accompanying drawings.

DATED this twenty-seventh day of July 1995

ANTHONY PAUL AHRENS
By My Patent Attorney

JOHN R.G. GARDNER

ABSTRACT

Material transfer apparatus (10) particularly suited for use with refuse vehicles including a chamber 11 having a segment shaped transfer paddle (14) pivotally mounted for movement in the chamber and having pushing faces (15 and 16). Hydraulic rams (22 and 23) are connected to the paddle (14) through a crank (19) and when actuated cause the paddle (14) to oscillate in the chamber (11) and push materials with the pushing faces (15 and 16) from the chamber (11). A refuse vehicle is also disclosed.

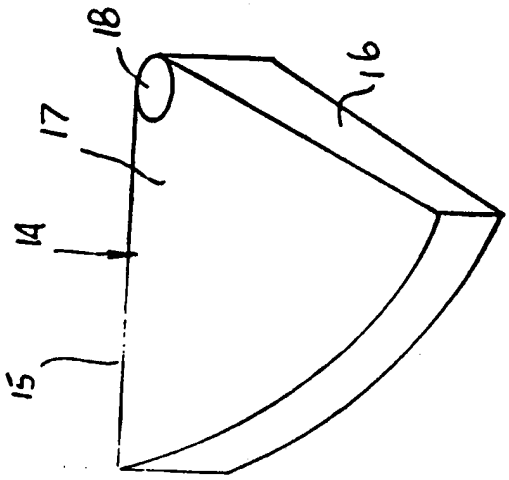


FIG.2

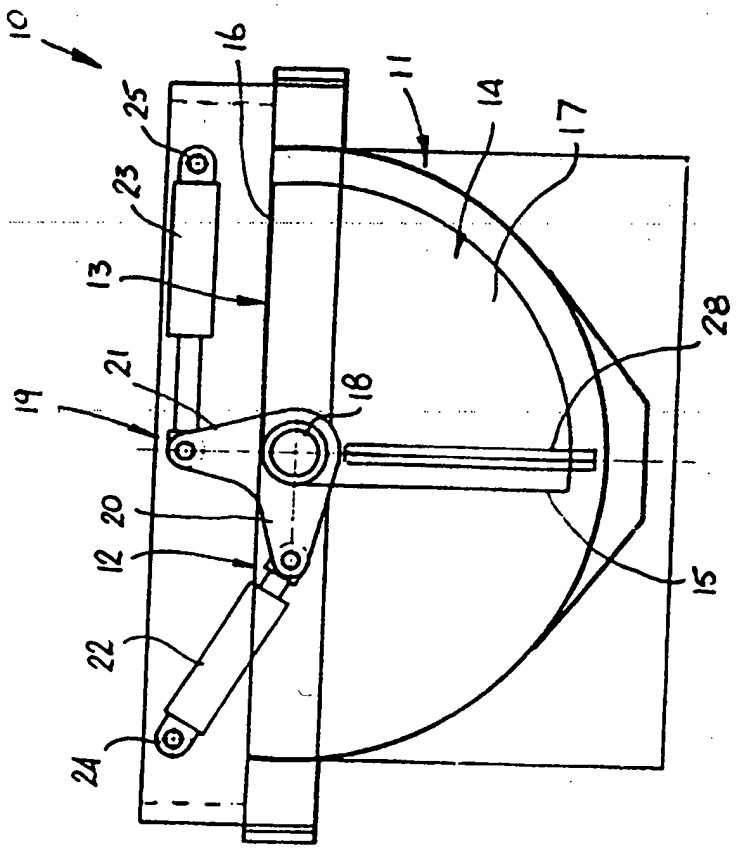


FIG.1

FIG.5

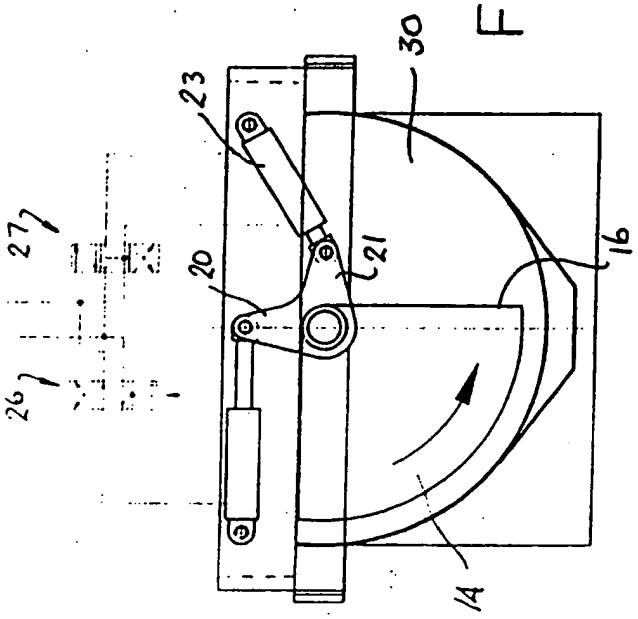


FIG.6

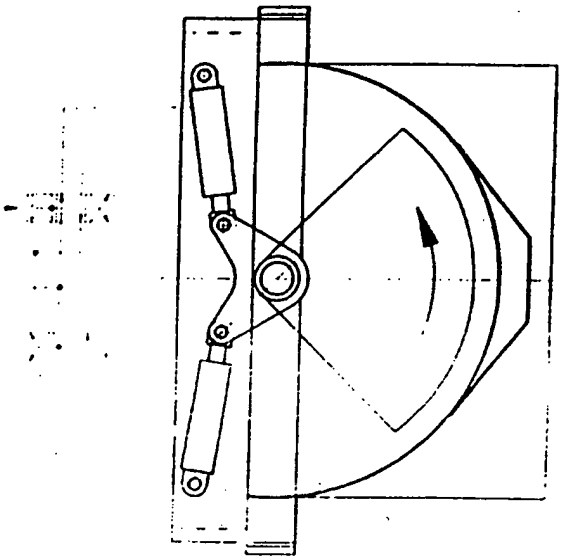


FIG.3

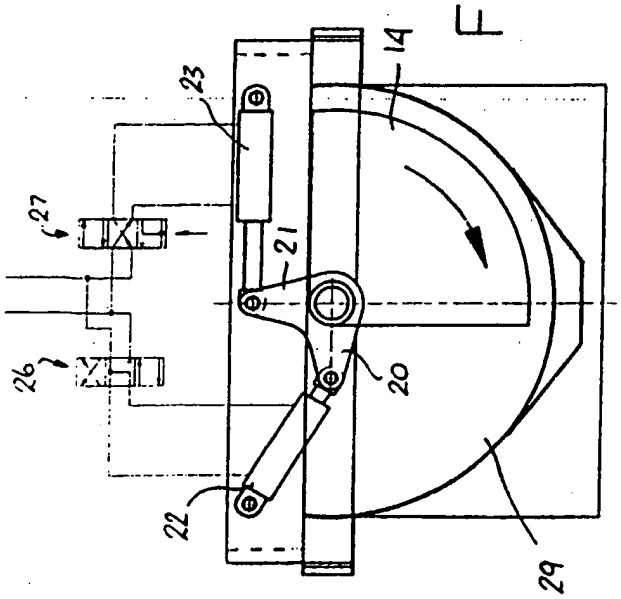
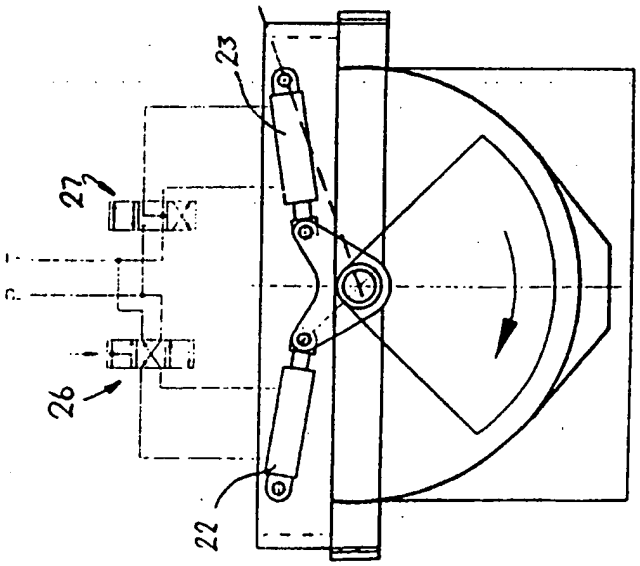


FIG.4



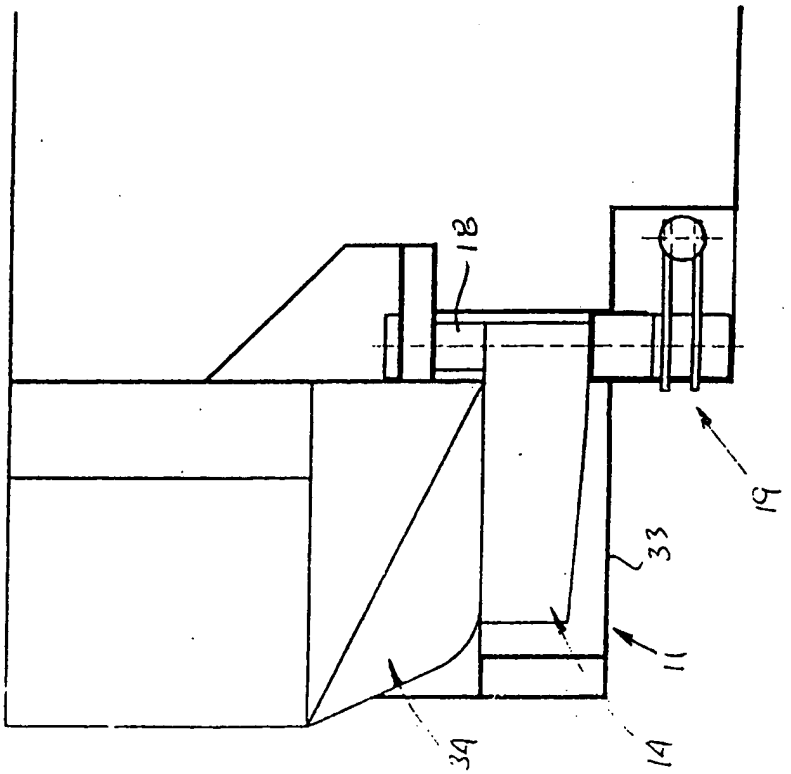


FIG.8

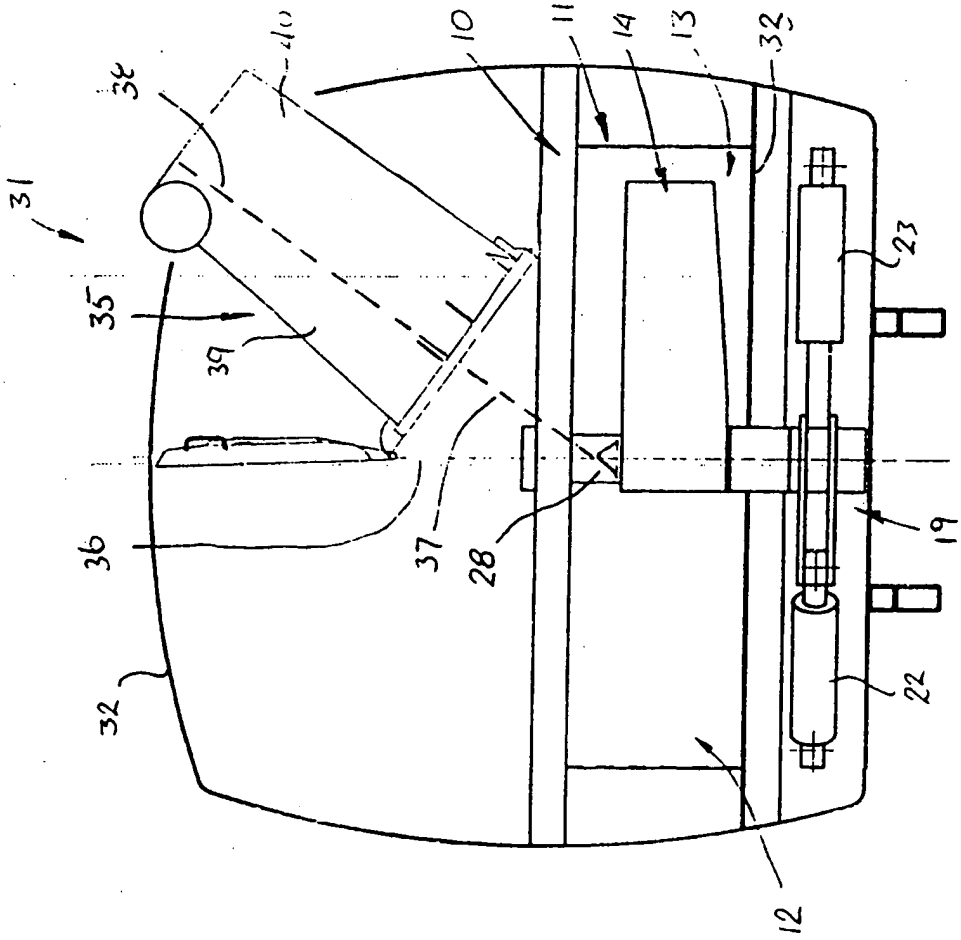


FIG.7

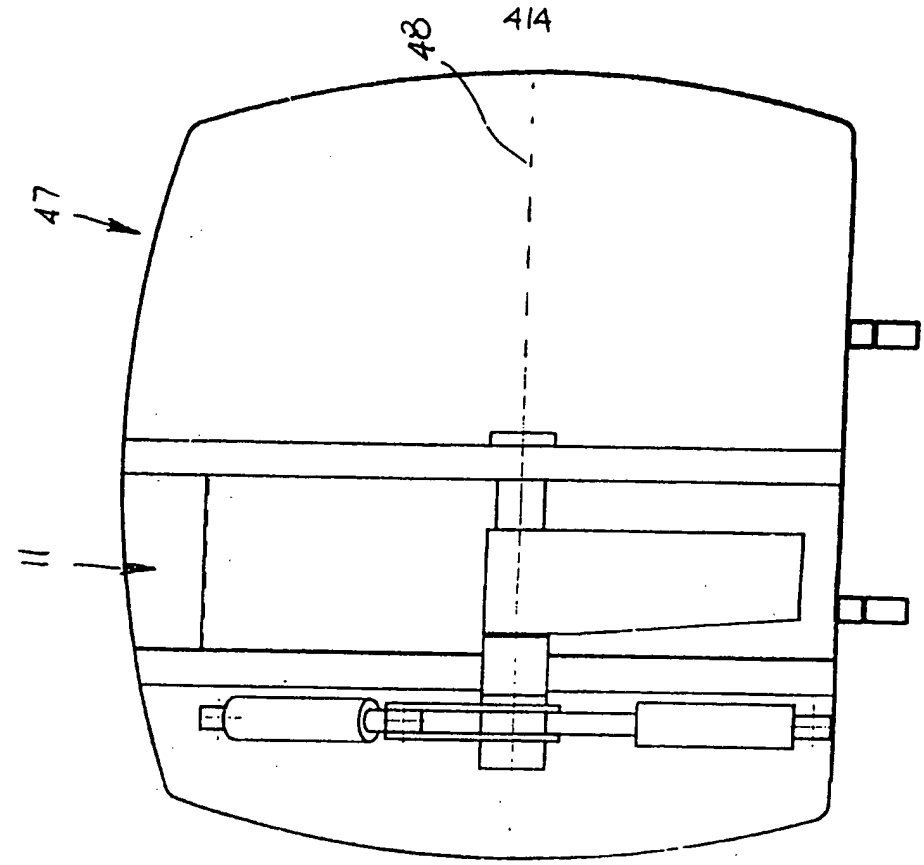


FIG.10

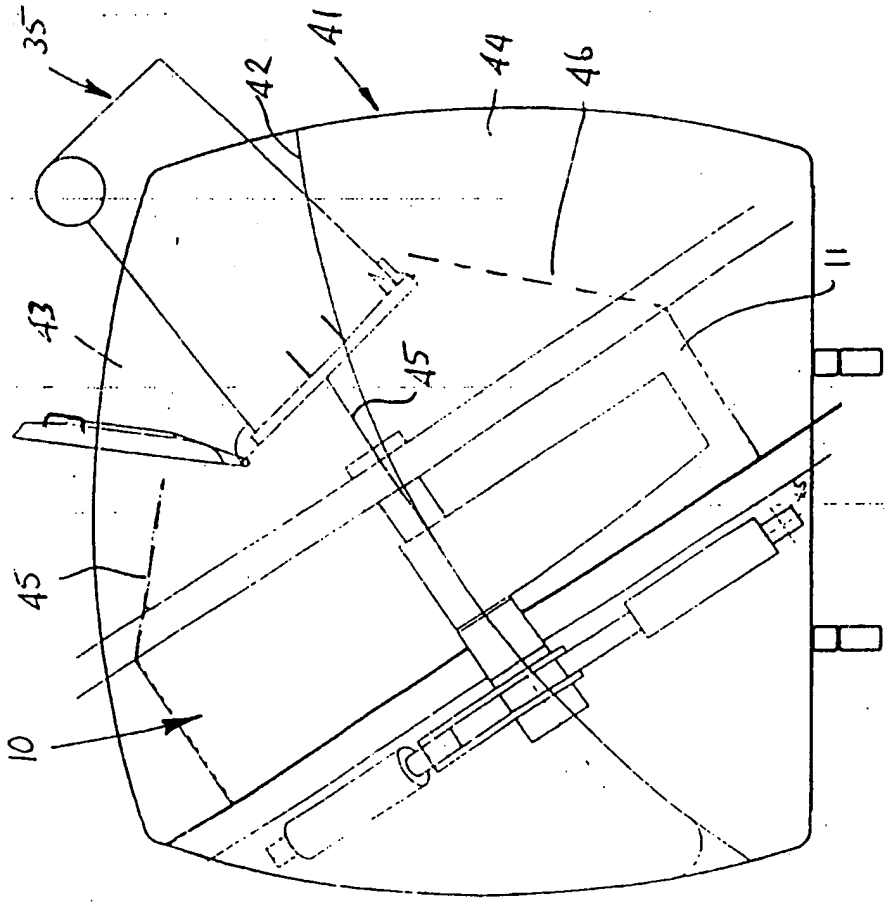


FIG.9